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Excercise: Lab Work 1

```
%Qno 1
x=[-9, 8, 7]
```

```
x = 1×3
    -9     8     7
```

```
y=[1, 2, -3]
```

```
y = 1×3
     1     2    -3
```

```
z=[11, 0, 2]
```

```
z = 1×3
    11     0     2
```

```
%Qno 1a
dot(x,y)
```

```
ans =
-14
```

```
%qno 1b
dot(cross(x,y),z)
```

```
ans =
-470
```

```
%qno 1c
dot(x,cross(y,z))
```

```
ans =
-470
```

```
%qno 1d
cross(cross(x,y),cross(z,x))
```

```
ans = 1×3
       -4230        3760        3290
```

```
%Qno 1e
cross(2*x,5*y)+9*z
```

```
ans = 1×3
  -281  -200  -242
```

```
%qno 2
marks=[21,99,45,97,15,89,100,78,68,37,44,56,77,88,99,22,19,3,50,44,78,98,86,65,91,51
]
```

```
marks = 1×26
    21    99    45    97    15    89   100    78    68    37    44    56    77 ···
```

```
%Qno 2a
length(marks)
```

```
ans =
26
```

```
%Qno 2b
mean(marks)
```

```
ans =
62.3077
```

```
%qno 2c
max(marks)
```

```
ans =
100
```

```
min(marks)
```

```
ans =
3
```

```
%Qno 2d
sort(marks,'ascend')
```

```
ans = 1×26
     3    15    19    21    22    37    44    44    45    50    51    56    65 ···
```

```
sort(marks,'descend')
```

```
ans = 1×26
   100    99    99    98    97    91    89    88    86    78    78    77    68 ···
```

```
%Qno 3
P=[99,12,3;4,43,6;77,65,49]
```

```
P = 3×3
    99    12     3
     4    43     6
    77    65    49
```

```
Q=[91,22,35;14,42,16;72,43,51]
```

```
Q = 3×3
```

```
    91    22    35
    14    42    16
    72    43    51
```

```
R=[1,2,3;4,9,8]
```

```
R = 2×3
     1     2     3
     4     9     8
```

```
%qno 3 i a
3*P+Q+P*Q
```

```
ans = 3×3
        9781        2869        3854
        1424        2323        1168
       11748        6769        6432
```

```
%qno 3 i b
Q*transpose(R)
```

```
ans = 3×2
         240         842
         146         562
         311        1083
```

```
%qno 3 i c
(R*Q)-(R)
```

```
ans = 2×3
         334         233         217
        1062         801         684
```

```
%qno 3 i d
(P^2)*Q
```

```
ans = 3×3
      981018      323706      409500
      166356      142966      101406
     1374936      676346      672546
```

```
%qno i f
det(P)
```

```
ans =
164022
```

```
%qno 3 i g
inv(P)
```

```
ans = 3×3
    0.0105   -0.0024   -0.0003
```

```
    0.0016    0.0282   -0.0035
   -0.0186   -0.0336    0.0257
```

```
%Qno 3 ii
diag(P+Q)
```

```
ans = 3×1
   190
    85
   100
```

```
%Qno 3 iii
trace(P+Q)
```

```
ans =
375
```

```
trace(P*Q)
```

```
ans =
17779
```

```
%qno 3 iv
eye(15)
```

```
ans = 15×15
     1     0     0     0     0     0     0     0     0     0     0     0     0 ···
     0     1     0     0     0     0     0     0     0     0     0     0     0
     0     0     1     0     0     0     0     0     0     0     0     0     0
     0     0     0     1     0     0     0     0     0     0     0     0     0
     0     0     0     0     1     0     0     0     0     0     0     0     0
     0     0     0     0     0     1     0     0     0     0     0     0     0
     0     0     0     0     0     0     1     0     0     0     0     0     0
     0     0     0     0     0     0     0     1     0     0     0     0     0
     0     0     0     0     0     0     0     0     1     0     0     0     0
     0     0     0     0     0     0     0     0     0     1     0     0     0
     0     0     0     0     0     0     0     0     0     0     1     0     0
     0     0     0     0     0     0     0     0     0     0     0     1     0
     0     0     0     0     0     0     0     0     0     0     0     0     1
     0     0     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0     0     0
     ⋮
```

```
%qno 3 v
L=P+Q
```

```
L = 3×3
   190    34    38
    18    85    22
   149   108   100
```

```
u=L(3,:)
```

```
u = 1×3
```

```
   149   108   100
```

```
%qno 3 vi
new=[P;u]
```

```
new = 4×3
    99    12     3
     4    43     6
    77    65    49
   149   108   100
```

```
%qno 3 vii
v=L(:,2)
```

```
v = 3×1
    34
    85
   108
```

```
%qno 4
A=[9,1,3;4,4,6;0,5,4]
```

```
A = 3×3
     9     1     3
     4     4     6
     0     5     4
```

```
n4=[24,56,78]
```

```
n4 = 1×3
    24    56    78
```

```
B=transpose(n4)
```

```
B = 3×1
    24
    56
    78
```

```
%qno 4 i
new2=[A B]
```

```
new2 = 3×4
     9     1     3    24
     4     4     6    56
     0     5     4    78
```

```
%qno 4 ii
X=inv(A)*B
```

```
X = 3×1
    2.2927
   20.0488
   -5.5610
```

```
%Qno 5
P=[10,3,13;44,21,62;7,35,49]
```

```
P = 3×3
    10     3    13
    44    21    62
     7    35    49
```

```
Q=[931,232,345;154,462,186;722,463,501]
```

```
Q = 3×3
   931   232   345
   154   462   186
   722   463   501
```

```
%qno 5 i
z=(P*Q)'
```

```
z = 3×3
       19158       88962       47285
        9725       48616       40481
       10521       50148       33474
```

```
y=Q'*P'
```

```
y = 3×3
       19158       88962       47285
        9725       48616       40481
       10521       50148       33474
```

```
if (z==y)
    disp('(PQ)^T = Q^T * P^T is true');
else
   disp(' (PQ)^T = Q^T * P^T is NOT true')
end
```

```
(PQ)^T = Q^T * P^T is true
```

```
%qno 5 ii
i=eye(3)
```

```
i = 3×3
     1     0     0
     0     1     0
     0     0     1
```

```
x=P*i
```

```
x = 3×3
    10     3    13
    44    21    62
     7    35    49
```

```
y=i*P
```

```
y = 3×3
    10     3    13
    44    21    62
     7    35    49
```

```
z=P
```

```
z = 3×3
    10     3    13
    44    21    62
     7    35    49
```

```
if (x==y)&(y==z)
    disp('PI=IP=P')
else
    disp('The PI , IP and P are not equal')
end
```

```
PI=IP=P
```

```
%Qno 6
A=[2,3,-1;3,-8,6;1,1,10]
```

```
A = 3×3
     2     3    -1
     3    -8     6
     1     1    10
```

```
B=[4;1;12]
```

```
B = 3×1
     4
     1
    12
```

```
X = inv(A)*B
```

```
X = 3×1
    1.0000
    1.0000
    1.0000
```

```
% Things to remember : inv(A)*B can also be written as A \ B
```

```
%qno 7
A=zeros(3,3)
```

```
A = 3×3
     0     0     0
     0     0     0
     0     0     0
```

```
B=zeros(3,3); B(1,2)=1
```

```
B = 3×3
```

```
     0     1     0
     0     0     0
     0     0     0
```

```
C=eye(3,3)
```

```
C = 3×3
     1     0     0
     0     1     0
     0     0     1
```

```
D=[2,2,2,2,2];diag(D)
```

```
ans = 5×5
     2     0     0     0     0
     0     2     0     0     0
     0     0     2     0     0
     0     0     0     2     0
     0     0     0     0     2
```

```
E=3*eye(5); E(1,1)=1; E(1,2)=2; E(2,1)=3; E(2,2)=7
```

```
E = 5×5
     1     2     0     0     0
     3     7     0     0     0
     0     0     3     0     0
     0     0     0     3     0
     0     0     0     0     3
```

```
A=2*eye(5,4); C=[1,1,1,1,3]; F=[A C']
```

```
F = 5×5
     2     0     0     0     1
     0     2     0     0     1
     0     0     2     0     1
     0     0     0     2     1
     0     0     0     0     3
```

```
%qno 8
z=primes(40); z=z(z>4)
```

```
z = 1×10
     5     7    11    13    17    19    23    29    31    37
```

```
%qno 9
name=[11,18,9,19,8]
```

```
name = 1×5
    11    18     9    19     8
```

```
%qno 10
A=zeros(1,5)
```

```
A = 1×5
```

```
     0     0     0     0     0
```

```
%qno 11
A=zeros(4,5)
```

```
A = 4×5
     0     0     0     0     0
     0     0     0     0     0
     0     0     0     0     0
     0     0     0     0     0
```

```
%qno 12
P=[10,3,13;44,21,62;7,35,49]
```

```
P = 3×3
    10     3    13
    44    21    62
     7    35    49
```

```
%qno 12 a
transpose(P) % also can just write P'
```

```
ans = 3×3
    10    44     7
     3    21    35
    13    62    49
```

```
%qno 12 b
P(1,3)
```

```
ans =
13
```

```
%qno 12 c
P(2,:)
```

```
ans = 1×3
    44    21    62
```

```
%qno 12 d
P(:,3)
```

```
ans = 3×1
    13
    62
    49
```

```
%qno 12 e
det(P)
```

```
ans =
1.5330e+03
```

```
%qno 12 f
inv(P)
```

```
ans = 3×3
   -0.7443    0.2009   -0.0568
   -1.1233    0.2603   -0.0313
    0.9087   -0.2146    0.0509
```

```
%qno 12 g
Z=inv(P)*P
```

```
Z = 3×3
    1.0000    0.0000   -0.0000
   -0.0000    1.0000   -0.0000
   -0.0000   -0.0000    1.0000
```

```
X=P*inv(P)
```

```
X = 3×3
    1.0000         0         0
   -0.0000    1.0000    0.0000
         0         0    1.0000
```

```
Z*X
```

```
ans = 3×3
    1.0000    0.0000   -0.0000
   -0.0000    1.0000   -0.0000
   -0.0000   -0.0000    1.0000
```

```
%qno 12 h
X=P*P'
```

```
X = 3×3
         278        1309         812
        1309        6221        4081
         812        4081        3675
```

```
Y=P'*P
```

```
Y = 3×3
        2085        1199        3201
        1199        1675        3056
        3201        3056        6414
```

```
%qno 12 i
square=P.^2
```

```
square = 3×3
         100           9         169
        1936         441        3844
          49        1225        2401
```

```
%qno 12 j
P^3
```

```
ans = 3×3
       34013       45832       84872
      173056      234917      434128
      160888      220920      407029
```

```
%qno 12 k
added= P+2
```

```
added = 3×3
    12     5    15
    46    23    64
     9    37    51
```

```
%qno 12 l
trace(inv(P)*P)
```

```
ans =
3.0000
```

```
trace(P'*P)
```

```
ans =
10174
```

```
trace(3*P)
```

```
ans =
240
```

```
trace(-P)
```

```
ans =
-80
```

```
%qno 13
V=[2,-6,7,3,2,7];
Z=diag(V)
```

```
Z = 6×6
     2     0     0     0     0     0
     0    -6     0     0     0     0
     0     0     7     0     0     0
     0     0     0     3     0     0
     0     0     0     0     2     0
     0     0     0     0     0     7
```

```
%qno 14 a
a=[3,3,-1;3,-8,6;1,1,10]
```

```
a = 3×3
```

```
     3     3    -1
     3    -8     6
     1     1    10
```

```
b=[4;7;22]
```

```
b = 3×1
     4
     7
    22
```

```
augmented=[a b]
```

```
augmented = 3×4
     3     3    -1     4
     3    -8     6     7
     1     1    10    22
```

```
rref(augmented)
```

```
ans = 3×4
     1     0     0     1
     0     1     0     1
     0     0     1     2
```

```
x=inv(a)*b
```

```
x = 3×1
    1.0000
    1.0000
    2.0000
```

```
if(rank(augmented)==size(augmented,2))
    disp('Unique solution')
elseif (rank(augmented)==size(augmented,2)-1)
    disp('infinitely many solutions and it represents a straight line')
elseif (rank(augmented)==size(augmented,2)-2)
    disp('infinitely many solutions and represents a plane')

end
```

```
infinitely many solutions and it represents a straight line
```

```
%qno 14 b
a=[4,-3,2,5;9,-2,-3,6;2,11,3,-6;8,-3,5,-1]
```

```
a = 4×4
     4    -3     2     5
     9    -2    -3     6
     2    11     3    -6
     8    -3     5    -1
```

```
b=[10;7;13;14]
```

```
b = 4×1
    10
     7
    13
```

```
    14
```

```
augmented=[a b]
```

```
augmented = 4×5
     4    -3     2     5    10
     9    -2    -3     6     7
     2    11     3    -6    13
     8    -3     5    -1    14
```

```
rref(augmented)
```

```
ans = 4×5
     1     0     0     0     1
     0     1     0     0     1
     0     0     1     0     2
     0     0     0     1     1
```

```
x=inv(a)*b
```

```
x = 4×1
    1.0000
    1.0000
    2.0000
    1.0000
```

```
if(rank(augmented)==size(augmented,2))
    disp('Unique solution')
elseif(rank(augmented)==size(augmented,2)-1)
    disp('infinitely many solutions and it represents a straight line')
elseif(rank(augmented)==size(augmented,2)-2)
    disp('infinitely many solutions and it represents a plane')
end
```

```
infinitely many solutions and it represents a straight line
```

```
%qno 14 c
a=[1,-3,2,5;2,-2,3,6;2,11,-3,-6;5,6,2,5]
```

```
a = 4×4
     1    -3     2     5
     2    -2     3     6
     2    11    -3    -6
     5     6     2     5
```

```
b=[3;11;40;54]
```

```
b = 4×1
     3
    11
    40
    54
```

```
augmented=[a b]
```

```
augmented = 4×5
     1    -3     2     5     3
     2    -2     3     6    11
```

```
     2    11    -3    -6    40
     5     6     2     5    54
```

```
rref(augmented)
```

```
ans = 4×5
    1.0000         0         0    2.4545   12.5455
         0    1.0000         0   -1.0909    0.0909
         0         0    1.0000   -0.3636   -4.6364
         0         0         0         0         0
```

```
x=inv(a)*b
```

```
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =  3.340949e-18.
x = 4×1
   -64
    32
     0
     0
```

```
if(rank(augmented)==size(augmented,2))
    disp('Unique solution')
elseif(rank(augmented)==size(augmented,2)-1)
    disp('infinitely many solutions and it represents a straight line')
elseif(rank(augmented)==size(augmented,2)-2)
    disp('infinitely many solutions and it represents a plane')
end
```

```
infinitely many solutions and it represents a plane
```

```
%qno 14 d
a=[4,-3,2,5;9,-2,-3,6;5,1,-5,1;8,-6,4,10]
```

```
a = 4×4
     4    -3     2     5
     9    -2    -3     6
     5     1    -5     1
     8    -6     4    10
```

```
b=[10;7;13;20]
```

```
b = 4×1
    10
     7
    13
    20
```

```
augmented=[a b]
```

```
augmented = 4×5
     4    -3     2     5    10
     9    -2    -3     6     7
     5     1    -5     1    13
     8    -6     4    10    20
```

```
rref(augmented)
```

```
ans = 4×5
```

```
    1.0000         0   -0.6842    0.4211         0
         0    1.0000   -1.5789   -1.1053         0
         0         0         0         0    1.0000
         0         0         0         0         0
```

```
x=inv(a)*b
```

```
Warning: Matrix is singular to working precision.
x = 4×1
   I
   I
   I
   I
```

```
if(rank(augmented)==size(augmented,2))
    disp('Unique solution')
elseif(rank(augmented)==size(augmented,2)-1)
    disp('infinitely many solutions and it represents a straight line')
elseif(rank(augmented)==size(augmented,2)-2)
    disp('infinitely many solutions and it represents a plane')
```

```
infinitely many solutions and it represents a plane
```

```
end
```

```
%Qno 14 e
a=[1,1,-1;2,-2,3;3,2,-5]
```

```
a = 3×3
     1     1    -1
     2    -2     3
     3     2    -5
```

```
b=[7;9;10]
```

```
b = 3×1
     7
     9
    10
```

```
augmented=[a b]
```

```
augmented = 3×4
     1     1    -1     7
     2    -2     3     9
     3     2    -5    10
```

```
rref(augmented)
```

```
ans = 3×4
     1     0     0     5
     0     1     0     5
     0     0     1     3
```

```
x=inv(a)*b
```

```
x = 3×1
```

```
    5.0000
    5.0000
    3.0000
```

```
if(rank(augmented)==size(augmented,2))
    disp('Unique solution')
elseif(rank(augmented)==size(augmented,2)-1)
    disp('infinitely many solutions and it represents a straight line')
elseif(rank(augmented)==size(augmented,2)-2)
    disp('infinitely many solutions and it represents a plane')
end
```

```
infinitely many solutions and it represents a straight line
```

```
%qno 15 a
a=[3,3,-1;3,-8,6;1,1,10]
```

```
a = 3×3
     3     3    -1
     3    -8     6
     1     1    10
```

```
b=[4;7;22]
```

```
b = 3×1
     4
     7
    22
```

```
z=det(a)
```

```
z =
-341
```

```
if(det(a)==0)
    disp('the inverse of matrix a is not possible as determinant is 0 so it cannot
be solved')
else
    disp('the inverse of this matrix is possible so it can be solved')
      inverse=inv(a)
    x=a\b
end
```

```
the inverse of this matrix is possible so it can be solved
inverse = 3×3
    0.2522    0.0909   -0.0293
    0.0704   -0.0909    0.0616
   -0.0323         0    0.0968
x = 3×1
     1
     1
     2
```

```
%qno 15 b
a=[4,-3,2,5;9,-2,-3,6;2,11,3,-6;8,-3,5,-1]
```

```
a = 4×4
     4    -3     2     5
     9    -2    -3     6
     2    11     3    -6
     8    -3     5    -1
```

```
b=[10;7;13;14]
```

```
b = 4×1
    10
     7
    13
    14
```

```
z=det(a)
```

```
z =
-3753
```

```
if(det(a)==0)
    disp('the inverse of matrix a is not possible as determinant is 0 so it cannot
be solved')
else
    disp('the inverse of this matrix is possible so it can be solved')
      inverse=inv(a)
    x=a\b
end
```

```
the inverse of this matrix is possible so it can be solved
inverse = 4×4
   -0.0647    0.0791    0.0144    0.0647
    0.0791    0.0144    0.0935   -0.0791
    0.1953   -0.1194    0.0389    0.0269
    0.2212   -0.0069    0.0290   -0.1100
x = 4×1
    1.0000
    1.0000
    2.0000
    1.0000
```

```
%Qno 15 c
a=[1,-3,2,5;2,-2,3,6;2,11,-3,-6;5,6,2,5]
```

```
a = 4×4
     1    -3     2     5
     2    -2     3     6
     2    11    -3    -6
     5     6     2     5
```

```
b=[3;11;40;54]
```

```
b = 4×1
     3
    11
    40
    54
```

```
z=det(a)
```

```
z =
-3.9690e-15
```

```
if(det(a)==0)
    disp('the inverse of matrix a is not possible as determinant is 0 so it cannot
be solved')
else
    disp('the inverse of this matrix is possible so it can be solved')
       inverse=inv(a)
    x=a\b
end
```

```
the inverse of this matrix is possible so it can be solved
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =  3.340949e-18.
inverse = 4×4
1.0e+15 *
    6.8026    6.8026    6.8026   -6.8026
   -3.0234   -3.0234   -3.0234    3.0234
   -1.0078   -1.0078   -1.0078    1.0078
   -2.7714   -2.7714   -2.7714    2.7714
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =  3.340949e-18.
x = 4×1
   -4.0699
    7.4755
   -2.1748
    6.7692
```

```
%qnO 15 D
a=[4,-3,2,5;9,-2,-3,6;5,1,-5,1;8,-6,4,10]
```

```
a = 4×4
     4    -3     2     5
     9    -2    -3     6
     5     1    -5     1
     8    -6     4    10
```

```
b=[10;7;13;20]
```

```
b = 4×1
    10
     7
    13
    20
```

```
z=det(a)
```

```
z =
0
```

```
if(det(a)==0)
    disp('the inverse of matrix a is not possible as determinant is 0 so it cannot
be solved')
else
    disp('the inverse of this matrix is possible so it can be solved')
     inverse=inv(a)
    x=a\b
```

```
end
```

```
the inverse of matrix a is not possible as determinant is 0 so it cannot be solved
```

```
%qno 15 e
a=[1,1,-1;2,-2,3;3,2,-5]
```

```
a = 3×3
     1     1    -1
     2    -2     3
     3     2    -5
```

```
b=[7;9;10]
```

```
b = 3×1
     7
     9
    10
```

```
z=det(a)
```

```
z =
13.0000
```

```
if(det(a)==0)
    disp('the inverse of matrix a is not possible as determinant is 0 so it cannot
be solved')
else
    disp('the inverse of this matrix is possible so it can be solved')
     inverse=inv(a)
    x=a\b
end
```

```
the inverse of this matrix is possible so it can be solved
inverse = 3×3
    0.3077    0.2308    0.0769
    1.4615   -0.1538   -0.3846
    0.7692    0.0769   -0.3077
x = 3×1
    5.0000
    5.0000
    3.0000
```

```
%qno 16 a
a=[3,3,-1;3,-8,6;1,1,10]
```

```
a = 3×3
     3     3    -1
     3    -8     6
     1     1    10
```

```
b=[4;7;22]
```

```
b = 3×1
     4
     7
    22
```

```
x=inv(a)*b
```

```
x = 3×1
    1.0000
    1.0000
    2.0000
```

```
%qno 16 b
a=[4,-3,2,5;9,-2,-3,6;2,11,3,-6;8,-3,5,-1]
```

```
a = 4×4
     4    -3     2     5
     9    -2    -3     6
     2    11     3    -6
     8    -3     5    -1
```

```
b=[10;7;13;14]
```

```
b = 4×1
    10
     7
    13
    14
```

```
x=inv(a)*b
```

```
x = 4×1
    1.0000
    1.0000
    2.0000
    1.0000
```

```
%qno 16 c
a=[1,-3,2,5;2,-2,3,6;2,11,-3,-6;5,6,2,5]
```

```
a = 4×4
     1    -3     2     5
     2    -2     3     6
     2    11    -3    -6
     5     6     2     5
```

```
b=[3;11;40;54]
```

```
b = 4×1
     3
    11
    40
    54
```

```
x=inv(a)*b
```

```
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =  3.340949e-18.
x = 4×1
   -64
    32
     0
     0
```

```
%qno 16 d
a=[4,-3,2,5;9,-2,-3,6;5,1,-5,1;8,-6,4,10]
```

```
a = 4×4
     4    -3     2     5
     9    -2    -3     6
     5     1    -5     1
     8    -6     4    10
```

```
b=[10;7;13;20]
```

```
b = 4×1
    10
     7
    13
    20
```

```
x=inv(a)*b
```

```
Warning: Matrix is singular to working precision.
x = 4×1
   I
   I
   I
   I
```

```
%Qno 16 e
a=[1,1,-1;2,-2,3;3,2,-5]
```

```
a = 3×3
     1     1    -1
     2    -2     3
     3     2    -5
```

```
b=[7;9;10]
```

```
b = 3×1
     7
     9
    10
```

```
x=inv(a)*b
```

```
x = 3×1
    5.0000
    5.0000
    3.0000
```